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Forest Service, United States Department of Agriculture

ALLEGHENY FOREST EXPERIMENT STATION*

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Technical Note No. 5.

CROWN COVER AND OPEN SPACE BEFORE AND AFTER PARTIAL CUTTING ON PERMANENT SAMPLE PLOTS

In 1928 the Allegheny Station established four permanent sample plots of one acre each in a timber sale area on Little Arnot Creek, Warren County, Pennsylvania, within the Allegheny National Forest. One of these plots was clear cut, two were partially cut, and the check was left intact except for the accidental removal of a few hemlocks and the swamping of a haul road. The stand was predominantly 60 years old, having followed practically clear cutting of hemlock and the heavy culling of hardwoods in a presumably beech-birch-maple-hemlock virgin forest. For details of the composition of the stand in 1928 see Technical Note No. 6.

The two partially-cut plots received the following treatment:

Plot #1 was selectively marked for the removal as sawlogs of "over-mature and wolf" trees, and as chemical wood of inferior species, defectives, and trees crippled in the sawlog cutting. Vigorous, well-formed trees, as well-spaced as possible, were left as the basis of a future cut.

Plot #3 was marked to a 10-inch d.b.h. limit and all merchantable sawlogs were cut. No slash removal or cutting of trees under 10 inches d.b.h. was done.

The crowns of all trees 2 inches in diameter and over were mapped in 1928, and their areas in square feet planimetered from the maps. Changes in total crown cover due to the above treatments, as well as to death of some trees and growth of others into the 2" d.b.h. class during the five-year period, are shown in the table on page 2; those due to change in the individual tree crowns are ignored, the mapping done in 1932 being confined to the new 2" trees. Totals include all overlapping and subjacent crowns which shade the same area two or more times. For the sake of a uniform basis of comparison percentages have been computed using the number of square feet in an acre - 43,560 - as 100 per cent. Due to the layering of tree crowns the original cover on all plots exceeded 100 per cent.

The table shows that plot #1, because originally more densely covered than the other plots, retained the highest per cent crown cover after selective cutting; that it had a very small loss of cover due to natural mortality; and that it made the highest gain in crown area from the growth of new trees into the 2-inch d.b.h. class. Inspection of the 1932 crown map shows the 106 per cent of crown cover present to be fairly well spaced; but due to overlapping there is still 39 per cent of actual open space (see following table). These openings on plots 1 and 3 account for a good development of advance reproduction and black cherry stump sprouts.

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Crown areas	Selective cutting Plot #1		Cutting to diameter limit Plot #3		Check Plot Plot #2	
	sq.ft.	per cent	sq.ft.	per cent	sq.ft.	per cent
Total before cutting, 1928	79,419	182	58,282	134	67,673	155
Removed by sawlog cutting, 1928	21,844	50	30,547	70	1,612 [1]	4
Removed by chemical wood cutting, 1929	14,549	33	None	-	2,269 [2]	5
Total removed, 1928-9	36,393	83	30,547	70	3,881	9
Total remaining after all cuttings	43,026	99	27,735	64	63,792	146
Trees growing into 2" class 1928-32	3,835	9	3,488	8	452	1
Trees dying from natural causes, 1928-32	602	2	2,896	7	4,322	10
Net total, 1932	46,259	106	28,327	65	59,922	137

[1] Represents removal of 5 hemlock trees before plot establishment.
[2] Represents removal of trees to widen road for hauling chemical wood through plot.

On plot #3 the initial crown cover was less than on plot #1. Hence a 70 per cent loss due to logging left a relatively small percentage as compared with selectively cut plot #1. Over half of the original crown cover was removed when the larger-crowned sawlog trees were cut in 1928. Mortality losses have been high, though less crown area was lost than on the check plot. Almost as much crown area in new trees developed during the 5-year period as on plot #1.

The check plot (#2) was reduced in crown area by the accidental cutting and natural mortality, though relatively little actual open space resulted. Few trees grew into the 2-inch d.b.h. class to add to the crown cover.

The planimetered area of all open spaces between horizontal crown projections is shown in the following table:

	Selective cutting Plot #1		Cutting to diameter limit. Plot #3:		Check plot Plot #2	
	sq.ft.	per cent	sq.ft.	per cent	sq.ft.	per cent
Before cutting, 1928	1,792	4	3,475	8	1,217	3
After all cuttings and mortality, 1929	18,813	43	22,686	52	3,617	8
In 1932	17,017	39	20,853	48	3,579	8

The increase in open space, due to cutting and natural mortality, was greatest on Plot #3. Decreases in open space in 1932 resulted from the presence of the crowns of trees which grew into the 2" d.b.h. class during the 5-year period. It must not be inferred that "actual open space" on these plots means that such areas are devoid of all vegetation or are continuously exposed to light. Shrubby and herbaceous plants, especially Rubus sp. and tree seedlings, together with stump sprouts and root suckers, took over all openings created by cutting and after several growing seasons created a dense low shade. In 1932 the tree species were gradually crowding out all shrubby growth.

A. F. Hough,
Assistant Silviculturist.

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